WAVE DYNAMICS
ACOUSTIC CONSULTANTS

# Ballyvatta 110kV Substation

Noise Impact Assessment

12 July 2024

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www.wdacoustics.com

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# Document Information

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# Executive Summary

Wave Dynamics were engaged by Ballyvatta Solar Farm Limited to undertake an operational noise impact assessment for the construction of a new 110kV Substation at Knockraha, Ballynanelagh, Co. Cork. As the substation is located near noise sensitive locations, a noise impact assessment of the substation and the cumulative noise from the proposed power generating developments surrounding the existing 220 kV substation are required to ensure the proposed substation does not have a negative noise impact on the noise sensitive locations nearby.

An attended noise survey was undertaken to measure the existing background noise levels in the area and quantify the existing noise environment. The survey also included measurements from the existing Knockraha 220kV substation. This report outlines the project criteria, survey results, assessment, and general guidance recommendations for:

- Construction noise and vibration from the construction phase of the project.
- Operational noise from the, proposed 110kV substation.
- Battery storage facilities.
- Operational noise from the cumulative operation of the existing 220kV substation, proposed 110kV substation, proposed synchronous compensator and battery storage facilities.

Appendix A outlines a glossary of the acoustic terminology used in this report.

## Construction Noise and Vibration

The construction noise and vibration from the development has been considered to the nearest noise sensitive locations (NSLs) locations of the proposed substation. The construction noise from the development will be of a short-term nature. The works have been assessed on the basis that they will be sequential.

**Based on the assessment outlined in this report it is predicted that the construction noise and vibration impact from the proposed 110 kV substation will comply with the recognised best practice standards typically adopted for such projects in Ireland.**

## Operational Noise Impact Assessment

An attended baseline survey was conducted to establish the existing noise environment and project criteria. Based on the nature of the facility there is potential for noise impact during both the day and night-time periods, therefore an assessment for both periods has been conducted.

The noise impact assessment included attended noise measurements at the existing Knockraha 220 kV substation and background noise measurements at the noise sensitive locations. The specific sound of the proposed cumulative noise from all of the proposed developments has been predicted based on a worst-case scenario as outlined in Section 5.

The noise levels from the proposed development in operation were assessed in line with BS4142 standards which predicted that there is no likely adverse noise impact at all noise sensitive locations for both day and nighttime periods. Compliance with EPA NG4 was also assessed and found to be complaint.

The cumulative noise impact for the daytime was assessed and it is predicted that the project criteria will be met for the predicted noise levels from the permitted and existing developments.

Based on the cumulative noise impact there is potential for a slight adverse impact in the nighttime at NSL1 & 2. The cumulative noise impact assessment indicates that the dominant noise contributors are the battery energy storage system, followed by the proposed Synchronous Compensator. This is reinforced in the DBA report "*Noise Impact Assessment: Proposed Battery Energy Storage System at Knockraha, Co. Cork*" which outlines that the

impact from the BESS may cause a slight adverse noise impact on its own at the noise sensitive locations. The proposed 110kV substation is not expected to cause an increase in noise levels at the NSLs.

**Based on the assessment outlined in this report it is predicted that noise levels from the proposed 110kV substation will comply with the project criteria at all noise sensitive locations.**

# Table of Contents

# 1 Introduction

Wave Dynamics were engaged by Ballyvatta Solar Farm Limited to undertake an assessment of the construction noise and vibration impacts and the operational noise impact for a new 110 kV substation at Knockraha, Ballynanelagh, Co. Cork.

An attended and unattended noise survey was undertaken to measure the existing background noise levels in the area and quantify the existing noise environment. This report outlines the project criteria, baseline survey results, assessment, and general guidance recommendations for:

- Construction noise and vibration from the construction phase of the project.
- Operational noise from the, proposed 110kV substation.
- Battery storage facilities.
- Operational noise from the cumulative operation of the existing 220kV substation, proposed 110kV substation, proposed synchronous compensator, solar farm and battery storage facilities.

Appendix A outlines a glossary of the acoustic terminology used in this report.

## 1.1 Statement of Competence

The attended measurements and report were completed by Wave Dynamics, an acoustic consultancy that specialises in noise and vibration. Our consultants have extensive experience in noise impact assessments.

This report was completed by Sean Rocks, Director | Senior Consultant, Sean has experience of numerous planning stage assessments. Sean's qualifications include; BEng (Hons) in Mechanical and Manufacturing Engineering, Diploma in Acoustics and Noise Control (Institute of Acoustics), IOA Certificate of Competence in Environmental Noise Measurement and SITRI certified sound insulation tester. Sean is a member of both Engineers Ireland and the Institute of Acoustics.

The peer review was completed by James Cousins, Managing Director | Principal Consultant with Wave Dynamics who has extensive experience in assessing noise impacts. James is an experienced acoustic consultant. His qualifications include; BSc (Hons) in Construction Management and Engineering, Pg Cert in Construction Law and Diploma in Acoustics and Noise Control (Institute of Acoustics) and an IOA Competence Cert in Building Acoustic Measurements. James is a member of both Engineers Ireland (MIEI) and the Institute of Acoustics (MIOA) and is the current SITRI Chairman.

# 2 Site Description

The proposed 110 kV substation is located adjacent to the existing 220kV substation in Knockraha, Ballynanelagh, Co. Cork. The substation is bounded by green field sites and the Ballynanelagh Road to the south. There are residential properties located in close proximity to the existing substation and the proposed 110kV substation. Figure 1 below indicates the position of the substations, other proposed developments, and the noise sensitive locations and locations of site measurements.


*Figure 1: Site location, proposed new substation and battery storage, measurement locations, noise sensitive locations (NSL) nearby and the surrounding area.*

# 3 Project Criteria

The acoustic criteria, for the project is set out in this section, the purpose of the criteria is to ensure reasonable:

- Operational noise from the, proposed 110kV substation and battery storage facilities.
- Operational noise from the cumulative operation of the existing 220kV substation, proposed 110kV substation, proposed synchronous compensator, solar farm and battery storage facilities.

To provide adequate conditions Wave Dynamics have developed the project criteria for:

- Construction noise and vibration.
- Operational noise impact.

### Acoustic Standards

The acoustic standards for assessing noise impact for the project have been developed from the following:

- ✓ Environmental Protection Agency NG4: Guidance note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities
- ✓ BS4142 2014 A1+ 2019
- ✓ ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures
- ✓ British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise
- ✓ British Standard BS7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration, and;
- ✓ British Standard BS5228-2: 2009 + A1: 2014: Code of practice for noise and vibration control on construction and open sites – Vibration.
- ✓ Cork County Council Noise Action Plan
- ✓ Previous experience on similar projects.

## 3.1 Noise Assessment Criteria

### 3.1.1 Construction Noise Assessment Criteria

There is currently no statutory Irish guidance for construction noise requirements from noise during the construction phase of a project.

In the absence of specific noise limits, the appropriate criteria for the allowable construction noise levels may be found in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.

The standard (BS5228-1:2009+A1) provides examples of acceptable limits for construction and/or demolition noise in both subjective and objective form. For example, paragraph E.2 of the standard states:

> *"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."*

Paragraph E.2 goes on to state:

*"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:*

- *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;*
- *75 decibels (dBA) in urban areas near main roads in heavy industrial areas".*

Typically, the planning authority refer to BS 5228 Part 1 as a method to control construction noise from sites on the local environment. This standard is therefore the de facto appropriate standard in the absence of regulatory guidance.

The criteria for this project will be based on the ABC method, the ABC method takes the background noise measured in the area and sets the appropriate construction noise limits for the project based on the background noise levels.

For the purpose of this assessment buildings other than dwellings which have a residential function will be considered for the lower noise limit, this includes Hotels, B&B's, Student Accommodation, Co Living Developments etc. This is in line with the guidance and definition of noise sensitive residences of EPA NG4. Table 1 below outlines the project criteria in tabular form.

*Table 1: BS 5228: 1:2009+A1 threshold levels.*

| Assessment category and threshold value period | Threshold value, in decibels (dB) ($L_{Aeq}$) | | |
|---|---|---|---|
| | Category A[1] | Category B [2] | Category C[3] |
| Daytime (07:00 – 19:00) and Saturdays (07:00 – 14:00) | 65 | 70 | 75 |
| Evenings and weekends [4] | 55 | 60 | 65 |
| Night-time (23:00 to 07:00hrs) | 45 | 50 | 55 |

1) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
2) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
3) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category B values.
4) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

### 3.1.2 Construction Vibration Criteria

Best practice guidance is taken from British Standard BS 5228:2009 + A1 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 2 Vibration.

The standard recommends that for a soundly constructed residential property and similar structures (in good repair), the threshold for minor or cosmetic (i.e. non- structural) damage should be taken as a Peak Particle Velocity (PPV) (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:

*Table 2: Likely Construction Vibration Impact*

| Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of: | | | |
|---|---|---|---|
| **Building Type** | **Less than 15Hz** | **15 to 40Hz** | **40Hz and above** |
| Light framed structures/ residential buildings | 12 mm/s | 20 mm/s | 50 mm/s |

## 3.2 Operational Noise Criteria

Local authorities can set noise limits from typical commercial premises pertaining to noise however there is currently no national policy for operational noise limits from industrial facilities for planning noise assessments. Noise limits for new developments are typically sought from local council's noise action plan, EPA NG4 or BS4142. On review of the Cork County Council Noise Action Plan no specific guidance has been outlined for noise limits from commercial premises and therefore the criteria from EPA NG4 and BS4142 has been adopted for the project.

### BS 4142:2014+A1:2019

The standard describes a method for the assessment of commercial, industrial and background noise to quantify its impact on persons outside of a residential dwelling. BS 4142 has become the de facto standard for compliance investigation. In addition to the specified broadband noise levels the standards provide objective and subjective methods for the assessment of the impulsivity and tonality of the noise sources. This allows for a penalty/ correction to be applied to the measured noise level of the source ($L_{Aeq}$) to give the rating level ($L_{Ar,T}$).

It considers the likelihood of complaints by considering the margin by which the noise in source the background noise level.

BS 4142 states that and exceedance of the noise source of the background noise by:

- +10 dB or more indicates that complaints are likely,
- + 5 dB is of marginal significance, and;
- The rating level is more than 10 dB below the measured background noise level, then this is a positive indication that complaints are unlikely.

BS4142 outlines guidance for penalty corrections to be applied to the noise sources in question should the noise source have one of the following characteristics:

- The noise contains a distinguishable, discreet, continuous tone (whine, or hum);
- The noise contains distinct impulses (i.e. bangs),
- The noise is intermittent or:
- The noise is irregular.

### EPA NG4

EPA NG4 outlines that noise attributable solely to onsite activities from a licenced premises should not exceed the following limits:

- *Daytime (07:00hrs – 19:00hrs) – 55dB $L_{Ar,T}$*
- *Evening (19:00hrs – 23:00hrs) – 50dB $L_{Ar,T}$*
- *Night time (23:00hrs – 07:00hrs) – 45dB $L_{Aeq,T}$*

*During daytime and evening periods rigorous efforts should be made to avoid clearly audible tones and impulsive noise at all sensitive locations. A penalty of 5dB for tonal and/or impulsive elements is to be applied to the daytime and evening measured $L_{Aeq,T}$ values to determine the appropriate rating level ($L_{Ar,T}$). In all cases, an assessment by a competent person will be required.*
*During the night-time period no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL.*

# 4 Baseline Noise Survey

## 4.1 Baseline Noise Survey

An attended and unattended noise survey was conducted to assess the background noise levels, the typical noise sources and the noise levels from the operation of the existing 220kV substation located in Knockraha, Ballynanelagh, Co. Cork. The attended measurement survey included measurements of background noise and the noise emissions from the existing substation.

### 4.1.1 Site Description and Measurement Locations

The existing 220kV substation located Knockraha, Ballynanelagh, Co. Cork. The substation is bounded by green field sites and the Ballynanelagh Road to the south. There are a number of residential properties located near the existing substation and the proposed 110kV substation and proposed battery storage facility and proposed synchronous compensator. Figure 2 below indicates the position of the substations, both existing and proposed, along with the noise sensitive locations and locations of site measurements.


*Figure 2: Site location, NSL locations, facilities with/in planning in the vicinity and measurement locations L1 and A1-A5.*

### 4.1.2 Survey Methodology and Personnel

The attended surveys were completed by Cathal Reck (Technical Engineer)

#### Attended Noise Measurements

Noise measurements were undertaken in general accordance with ISO 1996-1:2016 using ISO Class 1 sound analysers. Attended measurements were taken for varying durations based on objective. Background noise measurements were taken over a 60-minute period for the daytime period and over 15 minutes for the night time period. Care was taken to avoid any effect on the measurements, the sound level meter was positioned at approximately 1.2m above ground level.

*Figure 3: Noise monitor setup at A1*

### 4.1.3 Survey Period

The attended noise measurements were undertaken on the 20th of February 2024.

### 4.1.4 Noise Measurement Equipment

A Class 1 sound level meter/noise logger in general accordance with IEC 61672-1:2013 was used for the attended measurements. Table 3 below summarises the measurement equipment used.

*Table 3: Noise Measurement Equipment*

| Description | WD Asset Number | Model | Serial No. | Calibration Certificate No. | Calibration Due Date |
|---|---|---|---|---|---|
| Calibrator | CAL1 | Nor 1251 | 31056 | AC230226 | 16/10/2024 |
| Calibrator | CAL3 | Nor 1251 | 32096 | U44813 | 10/07/2024 |
| Sound Level Meter | SLM1 | Nor 140 | 1405554 | U45343/U45344 /U45342 | 27/07/2025 |
| Sound Level Meter | SLM3 | Nor 140 | 1403082 | SLM230219 | 27/09/2025 |

### 4.1.5 Subjective Noise Environment

During the attended noise survey following noise sources were identified:

- Distant traffic noise from M8 and local roads,
- Electrical hum from existing substation,
- Birds chirping,
- Occasional dog barks
- Distant aircraft noise.

## 4.2 Noise Measurement Results

This section outlines the results of the attended noise measurements.

### Attended Measurement Results

Table 4 outlines the results of the attended measurement survey. These include noise measurement results of the existing substation at location A1.

*Table 4: Attended Noise Measurement Results*

| Measurement | | | | Measured Noise Levels (re 20µPa)) | | |
|---|---|---|---|---|---|---|
| **Location** | **Date** | **Time (hrs)** | **Duration (mins)** | **$L_{Aeq}$ dB** | **$L_{AFmax}$ dB** | **$L_{A90}$ dB** |
| A1 | 20/02/2024 | 14:18 | 05:00 | 42 | 58 | 37 |
| A1 | 20/02/2024 | 15:03 | 05:00 | 44 | 51 | 43 |
| A1 | 20/02/2024 | 15:08 | 05:00 | 43 | 58 | 42 |
| A3 | 20/02/2024 | 15:21 | 60:00 | 46 | 70 | 37 |
| A3 | 20/02/2024 | 16:21 | 15:00 | 46 | 71 | 35 |
| A2 | 20/02/2024 | 17:47 | 60:00 | 35 | 57 | 29 |
| L1 | 23/02/2024 | 05:25 | 15:00 | 36 | 50 | 34 |
| A4 | 23/02/2024 | 04:30 | 15:00 | 34 | 48 | 32 |
| A4 | 23/02/2024 | 04:49 | 15:00 | 39 | 59 | 30 |
| A5 | 23/02/2024 | 05:55 | 15:00 | 42 | 67 | 37 |

### Unattended Monitoring Results

Table 5 outlines the results of noise measurements at the unattended monitoring location L1. The noise logger was positioned in a free field state approximately 1.5m above ground level.

*Table 5: Unattended Measurement Results*

| Start Date | LAeq,16hour 07:00 - 23:00 dB | Lnight (LAeq,8hour 23:00 - 07:00) dB | Lden (00:00 - 00:00) dB | 10th highest night-time LAFmax | LA90 (23:00 - 07:00) dB | LA90 (07:00 - 19:00) | LA90 (19:00 - 23:00) |
|---|---|---|---|---|---|---|---|
| 20/02/2024 | 36[1] | 45 | N/A | 51 | 37 | 30[1] | 32 |
| 21/02/2024 | 46 | 43 | 52 | 50 | 34 | 40 | 38 |
| 22/02/2024 | 42 | 42 | 48 | 56 | 33 | 39 | 35 |

(1) Shortened measurement duration.

(2) Where night-time period is referred to the date is the date the measurement commenced on at 23:00hrs and finished at 07:00hrs on the following calendar day.

(3) Arithmetic average of $L_{AF90}$.

### Discussion of Measurement Results

The attended background measurements were taken on a weekday to establish the existing background noise levels. Additional localised measurements were undertaken onsite to establish the noise levels of typical

operating noise levels of the existing substation. The dominant noise sources at all background locations were road traffic noise and livestock. Other sources included birdsong, dogs barking, and aircraft.

The measurements were also screened for low background noise, when considering the $L_{Af90}$ (background noise)

### Consideration of Low Background Noise

From the measurements it can be seen that both the unattended noise monitor and background noise measurements demonstrate that it is not an area of low background noise. Therefore, the standard NG4 criteria has been applied to the project.

## 4.3 Weather Conditions for Monitoring Period

Good weather conditions were noted during the attended survey, with winds typically less than 5 m/s and no rain and clear skies.

# 5 Noise Impact Assessment

This section of the report outlines the impact assessment for construction noise and vibration and operational noise.

## 5.1 Construction Noise Assessment

Based on the location of the site the following noise sensitive locations have been identified. These noise sensitive locations were chosen as they are the closest NSL's to the works on the substation.


*Figure 4: Site location, measurement location, noise sensitive locations*

### Noise Limits

The criteria for the project based on the criteria outlined in section 3 and the background noise in the area the project criteria for construction noise is outlined below in Table 6. Reference to the baseline survey results and guidance contained in BS 5228 Part 1 for construction noise levels threshold for significance affect from constriction activities is set as follows for the closest noise sensitive locations:

*Table 6: Threshold of significant impact at dwellings*

| Assessment category and threshold Value Period (Laeq) | Threshold value in decibels (dB) | | |
|---|---|---|---|
| | Category A | Category B | Category C |
| Night-time (23:00-07:00) | 45 | 50 | 55 |
| Evening and Weekends | 55 | 60 | 65 |
| Daytime (07:00-19:00) and Saturdays (07:00-13:00) | 65 | 70 | 75 |

1) A significant effect has been deemed to occur if the total $L_{Aeq}$ noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

2) If the ambient noise level exceeds the threshold values given in the table (i.e, the ambient noise level is higher that the above values), then a significant effect is deemed to occur if the total $L_{Aeq}$ noise level for the period increases by more than 3 dB due to construction activity.
3) Applied to residential locations only.

For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5dB. If the noise generated by construction activities exceeds the appropriate category value, then a significant effect is deemed to occur.

### 5.1.1 Construction Noise Predictions

Construction noise for the site has been predicted based on the typical construction works associated with substation construction. A summary of the expected equipment, durations and operating times are provided in for each site and works. The noise sources are assumed to be located at the centre of the development site. The prediction methodology in BS5228 has been used to calculate the noise level over a typical day for each of the main construction stages.

These predictions include the construction traffic from the site. Table 7 below outlines the plant used for the assessment of the noise impact from the substation works.

*Table 7: Construction noise assessment for proposed 110 kV substation*

| Construction Phase | Item of Plant (BS 5228-1:2009+A1:2014 Ref) | Noise Level ($L_{Aeq}$ at 10m dB(A)) | On Time of 10 hr day |
|---|---|---|---|
| Enabling Works | Digger | 77 | 3 hours |
| | Dump Truck | 79 | 3 hours |
| | Power Tools | 70 | 0.5 hours |
| | Road Lorry | 76 | 1 hour |
| Substructure | Excavators | 77 | 3 hours |
| | Power Tools | 70 | 1 hour |
| | Tracked Mobile Crane | 67 | 0.5 hour |
| | Road Lorry | 76 | 1 hour |
| | Dumper 7t | 81 | 1 hour |
| | Cement Mixer (Discharging) | 75 | 1 hour |
| | Telescopic Handler | 71 | 4 hours |
| | Concrete Pump | 78 | 0.5 hours |
| Civil & Electrical | Road Lorry | 76 | 1 hour |
| | Power Tools | 70 | 4 hours |
| | Impact Steel | 69 | 2 hours |
| | Hammer | 69 | 1 hour |
| | Dump Truck | 81 | 2 hours |
| | Telescopic Handler | 71 | 6 hours |

| Construction Phase | Item of Plant (BS 5228-1:2009+A1:2014 Ref) | Noise Level ($L_{Aeq}$ at 10m dB(A)) | On Time of 10 hr day |
|---|---|---|---|
| Superstructure | Tracked Mobile Crane | 67 | 0.5 hour |
| | Power Tools | 70 | 4 hours |
| | Impact Steel | 69 | 2 hours |
| | Hammer | 69 | 0.5 hour |
| | Cement Mixer (Discharging) | 75 | 1 hour |
| | Telescopic Handler | 71 | 6 hours |
| | Road Lorry | 76 | 1 hour |
| External Finishes | Hand Tools | 70 | 5 hours |
| | Power Tools | 70 | 2 hours |
| | Road Lorry | 76 | 1 hour |

### Predicted Construction Noise

Table 8 summarises the predicted construction noise level at the noise sensitive locations. Examination of the results indicate the construction noise without mitigation is predicted to be within the noise limits for all stages of the development.

The calculations set out below are based on assumed site construction works and a combination of the plant operating at the same time i.e. worst-case scenario.

*Table 8: Predicted noise levels **without** mitigation for each stage.*

| NSL | Criteria $L_{Aeq,10hr}$ dB | Predicted noise level (construction noise + ambient) with no mitigation $L_{Aeq,\ 10hr}$ dB | | | | |
|---|---|---|---|---|---|---|
| | | Enabling Works | Substructure | Civil & Electrical | Superstructure | External finishes |
| NSL1 | 65 | 60 | 60 | 60 | 58 | 55 |
| NSL2 | 65 | 59 | 60 | 60 | 58 | 51 |
| NSL3 | 65 | 59 | 60 | 60 | 58 | 54 |

## 5.1.2 General Recommendations

The construction noise impact is predicted to achieve the industry standard criteria without mitigation therefore no significant noise impact is anticipated from the construction phase of the development. This section of the report sets out general recommendations for the control of noise from construction works to further reduce any potential noise impact.

### Selection of Plant and Equipment

The noise impact of all plant and equipment should be assessed prior to selection of the plant for the project. Where an item of plant is identified as noisy with the potential to cause a negative noise impact it should be reviewed to check if there is an alternative quieter version of the same plant to undertake the same construction task.

## Noise Control at Source

Where replacing a noisy item of plant is not viable or practical, consideration should be given to control that noise at source. This includes modifying the piece of plant or equipment to generate less noise, using dampening to control vibration induced noise or rattling. Example best practice mitigation measures to be considered are as follows:

- All plant and equipment to be switched off when idling.
- The use of white noise reversing alarms.
- Restriction on the dropping and loading of materials to less sensitive hours.
- The use of local screening for noisy activities or works with hand tools
- Not dropping materials onto hard surfaces and using rubber mats etc for the dropping of materials.
- Ensure all plant and equipment is well maintained and cleaned, all lubrication should be in line with manufacturers guidelines.

## Screening

Screening when used correctly can be an effective method of reducing the construction noise impact on the NSL's. The use of site hoarding and careful selection of areas for noise works, using buildings on the site, site offices and the building being constructed to screen noise from the works.

Local screening of noisy works with the use of temporary acoustic barriers, examples are provided below:

- https://ventac.com/acoustic-products/noisebreak-acoustic-barrier/
- https://echobarrier.com/


*Figure 5: Temporary Construction Noise Barrier © Ventac*

## Public Engagement

It is recommended that a public liaison officer should be put forward by the contractor to liaise with the local residents on matters relating to noise. Residents should be informed of any noise works scheduled where there is the potential to generate high levels of construction noise or if specialist works etc need to be conducted out of the working hours. This person should also be the point of contact for all complaints and be responsible for reviewing the noise monitoring results and exceedances.

## Construction Noise Monitoring

Construction noise monitoring should be undertaken at periodic sample periods on the boundary with the nearest noise sensitive locations.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

### 5.1.3 Construction Vibration

The vibration impacts for construction are based on the vibration sources, soil type and distance to the locations. Given the distance to the closest sensitive location ( > 300m), the plant machinery involved in the construction phase it is unlikely that a negative vibration impact will be experienced by the sensitive locations.

## 5.2 Operational Phase

Following the survey a model of the development using SoundPLAN 9.0 modelling software was developed to establish the noise levels from the development in a worst-case scenario. The software implements the algorithms contained in ISO 9613-1 and ISO 9613-2. The noise model considers:

- Distance attenuation,
- Source and noise sensitive locations,
- Barrier effects (buildings, walls etc)
- Topographical elevations,
- Ground effects and absorption,
- Source sound power levels,
- Directivity and orientation of the source,
- Atmospheric attenuation and meteorological effects,

The acoustic model for the new development has been developed based on attended noise survey and the proposed site location and predicted noise sources. As the site has potential to create noise impact at both day and nighttime, a worst-case scenario has been developed for both predicting the noise impact at the nearest noise sensitive locations.

In addition to the measured noise levels of activities and plant on site outlined in Section 4, additional noise sources added to the model are outlined below.

#### Plant and Equipment Noise

For the purposes of this assessment Wave Dynamics have assumed the substation sound power levels based on previous based on previous similar projects of 110 kV substations which is outlined in Table 9 below.

*Table 9: Assumed noise levels for plant and equipment proposed.*

| Item | Assumed Noise Level ($L_{wA}$) | Reference |
|---|---|---|
| Substation Assumed (Equal or approved) | 92 dB | WDA Library |

## 5.3 Noise Impact Assessment for the Proposed 110 kV Substation.

As the new substation has the potential to generate noise with different characteristics for both the day and nighttime periods, a model has been undertaken for both.

The daytime situation assumes the following noise sources:

- Proposed 110kV substation operational 100% of the time.

### 5.3.1 Daytime Noise Impact Assessment for the Proposed 110kV Substation

Table 10 outlines the BS4142 noise impact assessment at the worst-case noise sensitive location (NSL1). All noise sensitive locations have been assessed for noise impact, NSL1 has been outlined in this section as this

has the highest predicted noise level from the proposed substation. All other NSLs are predicted to have lower onset noise levels due to the substation.

*Table 10: BS4142 Assessment for daytime period for proposed 110kV substation*

| Results | | Relevant BS 4142 Clause | Commentary |
|---|---|---|---|
| Predicted specific sound level (daytime) | $L_{Aeq(15min)}$ = 27dB | 7.3.6 | As the substation is not yet existing, the noise levels have been predicted using SoundPlan modelling software. Worst case specific sound predicted at NSL1. |
| Residual sound level (daytime) | $L_{Aeq(60min)}$ = 46dB | 7.3.2 | The residual sound level was dominated by road traffic noise on local roads in the area. Background location A3 assessed as this is representative for worst case noise sensitive location (NSL1). |
| Background sound level (daytime) | $L_{A90(60min)}$ = 37dB | 8.1.2<br>8.4 | The $L_{A90}$ sound level was measured at the noise sensitive location with the source absent. |
| Assessment made during the daytime, so the reference time interval is 1 hour | | 7.2 | |
| Specific sound level as predicted | $L_{Aeq(15min)}$ = 27dB | 7.3.6 | The specific sound has been predicted by calculation alone as the proposed 100kV substation is not existing. |
| Acoustic feature correction | +0dB | 9.2<br>9.3.2 | It is not anticipated that the specific sound will have any impulsive, tonal or intermittent characteristics. |
| Rating level | (27 + 0) dB = 27dB | 9.2 | |
| Background sound level | $L_{A90(60min)}$ = 37dB | 8 | |
| Excess of rating over background sound level | (27 - 37) dB = -10dB | 11 | Assessment indicates that no adverse impact is likely on the noise sensitive locations as the specific sound is 10dB below the background levels and is lower than the residual sound. Context has also been considered. |
| Uncertainty of the assessment | Not significant | 10 | The specific sound is a worst-case prediction to the closest NSL (NSL1) and assumes the 110kV substation will be operational 100% of the time. |

Based on the review of the noise sources and the BS 4142 assessment it is predicted that the noise emanating from the proposed 110kV substation will likely not have an adverse impact.

### NG4

NG4 recommends a daytime criteria of (07:00hrs – 19:00hrs) 55dB $L_{Aeq,T}$, the predicted noise emissions from the 110kV substation are 27 dBA, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved.

### 5.3.2 Nighttime Noise Impact Assessment for the Proposed 110kV Substation

As the proposed development has the potential to generate a noise impact in the nighttime period, a noise impact assessment has been undertaken for the nighttime scenario. The nighttime noise sources are the same as the daytime as it is assumed the 110 kV substation will operate continuously.

*Table 11: BS4142 Noise Impact Assessment for nighttime period for the proposed 110kV substation*

| **Results** | | **Relevant BS 4142 Clause** | **Commentary** |
|---|---|---|---|
| Predicted specific sound level (nighttime) | $L_{Aeq(15min)}$ = 27dB | 7.3.6 | As the substation is not yet existing, the noise levels have been predicted using SoundPlan modelling software. Worst case specific sound predicted at NSL1. |
| Residual sound level (nighttime) | $L_{Aeq(15min)}$ = 37dB | 7.3.2 | The residual sound level was dominated by road traffic noise on local roads in the area, existing substation also audible at A3 during night time period. Background location A4 assessed as this is representative for worst case noise sensitive location (NSL2), average background measurement at A4 assessed. |
| Background sound level (nighttime) | $L_{A90(15min)}$ = 31dB | 8.1.2<br>8.4 | The $L_{A90}$ sound level was measured at the noise sensitive location with the source absent. |
| Assessment made during the daytime, so the reference time interval is 15 minutes | | 7.2 | |
| Specific sound level as predicted | $L_{Aeq(15min)}$ = 27dB | 7.3.6 | The specific sound has been predicted by calculation alone as the new battery storage and substation were not existing at the time of the survey. |
| Acoustic feature correction | +0dB | 9.2<br>9.3.2 | It is not anticipated that the specific sound will have any impulsive, tonal or intermittent characteristics. |
| Rating level | (27 + 0) dB = 27dB | 9.2 | |
| Background sound level | $L_{A90(15min)}$ = 31dB | 8 | |
| Excess of rating over background sound level | (27 - 31) dB = -4dB | 11 | Assessment indicates that no adverse impact is likely on the noise sensitive locations as the specific sound is 4dB below the background levels and is lower than the residual sound. Context has also been considered. |
| Uncertainty of the assessment | Not significant | 10 | The specific sound is a worst-case prediction to the closest NSL (NSL1) and assumes the 110kV substation will be operational 100% of the time. |

### NG4

NG4 recommends a night time criteria of 45dB $L_{Aeq,T}$, the predicted noise levels from the new substation and battery storage facility are 27 dBA, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved.

## 5.4 Cumulative Noise Impact

This section outlines the predicted cumulative noise impact from the proposed 110 kV substation, and the other existing / permitted / proposed developments in the area which are not part of this proposed development. This includes:

- The existing 220kV substation.
- The proposed but not yet consented BESS facility (planning reference 235992) and
- The proposed synchronous compensator - Killeena Energy Ltd (planning reference 224488).
- The second proposed synchronous compensator – Island Stability Services Ltd (planning reference 226869).
- The proposed solar farm – Lightsource Renewable Energy Ireland Ltd (planning reference 300434-17)

Table 12 below outlines the relevant power generating developments with planning or applying for planning in the area.

*Table 12: Developments with existing planning or applying for planning within the wider area.*

| Ref: No. | Summary of Development Description | Decision | Decision Date |
|---|---|---|---|
| 17/5370; ABP-300434-17 | Construction, operation and decommissioning of photovoltaic solar farm comprising photovoltaic panels on ground mounted frames within a site of up to 48.4ha, to include inverter stations, 1 no. DNO substation, customer substation, switcher substations, field transformers, auxiliary transformers, GRP cabinets, monitoring house, single storey storage shed, battery containers, transformer containers, WC, fencing, temporary construction compound, access tracks, CCTV cameras, landscaping and all associated ancillary development works. | ABP Grant permission | 20th July 2018 |
| 23/4564 | Amendment of previous permission Reg. Ref: 17/5370 and ABP- 300434-17, which includes a enlarged site boundary, for alterations to an permitted solar farm to provide an additional area of 7.8ha to the south comprising photovoltaic panels on ground mounted frames, MV/inverter stations, fencing, access tracks, CCTV cameras, a weather station, landscaping and all associated ancillary development works. The development also includes a 2.25km cable route to the south to provide a link to a future substation and all associated ancillary development works. The application also seeks to amend Condition 3 of permission granted under Reg. Ref:17/5370 and ABP Ref: ABP-300434-17 to increase the lifespan of the permitted solar farm from 25 to 35 years. | CFI Submitted (15th February 2024) | Decision Due 13th March 2024 |
| 23/05992 | A ten year planning permission for an energy storage facility comprising; 1) energy storage | Further information | Pending |

| Ref: No. | Summary of Development Description | Decision | Decision Date |
|---|---|---|---|
| | containers installed on concrete plinths; 2) electrical inverters and transformers; 3) underground electrical and communications cabling; 4) the upgrade of an existing agricultural access point from the L6989; 5 ) on-site access track; 6) security fencing and security gates; 7) pole-mounted security cameras; 8) all associated and ancillary site development, landscaping and reinstatement works. The operational lifetime of the proposed development is 35-years. This planning application is accompanied by an Appropriate Assessment Screening report. | requested (27th November 2023) | |
| 22/4488 | Permission for a synchronous compensator (electricity grid stabilization) development within the townland of Killeena, near Knockraha, Co.Cork within a site area of approximately 0.8 hectares. Planning permission is sought for; (1) a High Inertia Synchronous Compensator (HISC) compound consisting of the following; 1 no. High Inertia Synchronous Compensator (HISC) building enclosed within a steel clad framed, housed structure (12.1m height with a total area of 504 sq.m); electrical container area consisting of 8 no. electrical equipment containers, 4 no. external cooler units; 1 auxiliary and start up Static Frequency Converter (SFC) transformer; 1 generator circuit breaker, 1 emergency diesel generator and 1 associated diesel storage tank. (2) a High Voltage (HV) compound consisting of a main transformer and high voltage equipment. (3) a Gas Insulated Switchgear (GIS) building compound consisting of the following; high voltage Gas Insulated Switchgear (GIS) housed structure (13.5m height with a total area of 558 sq.m); (4) upgrade to the existing site entrance onto the L6989, internal access tracks, fencing, landscaping and drainage. Planning permission is sought for a period of 10 years. | Conditional | 04/10/2022 |

The potential for cumulative and in-combination effects on the designated sites in the zone of influence were fully considered. The assessments carried out as part of the developments in the wider area were consulted.

An RFI submission has been complete including an updated noise impact assessment as part of the BESS Facility (reference 235992) which states that the BESS facility will have an slight noise impact at the surrounding noise sensitive locations, and with the addition of the proposed 110kV substation added to the assessment there is little to no increase in noise levels predicted at the noise sensitive locations. *"Planning application 23/05992 – Proposed battery energy storage facility at Ballynanelagh, Knockraha, Co. Cork RFI – noise impact assessment"* issued by MKO Planning and Environmental Consultants.

In addition to the BESS facility, there is also a proposed synchronous compensator permitted to Killeena Energy Ltd (reference 224488) included in the cumulative noise assessment in this report. A noise impact assessment has been undertaken by Fehily Timoney as part of the RFI response and is outlined in report "*Knockraha Synchronous Compensator, Further Information Response*".

### Other Considerations

Additional traffic noise on the roads and the proposed site not expected to increase the traffic noise from the roads to any significant impact. For context, if the traffic was to double on the roads this would lead to a 3 dB increase which is generally not perceptible. As the traffic generated onsite will likely only be for scheduled maintenance and access it is expected that the additional traffic will not have a negative impact on the road traffic noise levels.

## 5.4.1 Cumulative Noise Impact (BS 4142 Assessment) for Daytime Hours

The cumulative noise impact assessment in the daytime scenario assumes the following sources as outlined below and in Table 13. The cumulative noise impact assessment is based on the following information:

- Proposed 110kV substation on 100% of the time.
- Existing 220kV substation spectrum are on 100% of the time.
- Synchronous Compensator noise levels as per Fehily Timoney Noise Impact Assessment (planning reference 224488).
- Battery Energy Storage System with onsite 110kV substation noise levels as per DBA report (planning reference 235992).
- Solar Farm as per Neo Environmental report (planning reference 17/5370).
- The combined use of previous noise impact assessment results in conjunction with Wave Dynamics own noise model.

*Table 13: NSL noise levels for cumulative noise impact assessment.*

| Location | Predicted Noise Source Contributions (dBA) | | | | |
|---|---|---|---|---|---|
| | Proposed 110kV Substation | BESS+110 kV (ref 235992) | Existing 220kV Substation | Synchronous Compensator (ref 224488) | Combined |
| NSL2 | 26 | 33 | 26 | 24 | 35 |
| NSL1 | 27 | 32 | 31 | 30 | 36 |
| NSL3&4 | 24 | 31 | 23 | 24[1] | 33 |

(1) Not predicted in the Fehily Timoney report. Prediction of noise impact at these NSLs extrapolated from Fehiley Timoney report.

The cumulative noise impact at the nearest noise sensitive locations has been assessed in accordance with BS 4142. Table 14 below outlines the cumulative noise impact assessment at NSLs 1-4. As these are the closest noise sensitive locations to all the proposed developments these are predicted to be the worst case affected locations for the cumulative noise impact. The cumulative noise levels at all other noise sensitive locations are predicted to be lower than those outlined in Table 14.

*Table 14: Cumulative BS4142 Assessment for daytime period*

| Results | | Relevant BS 4142 Clause | Commentary |
|---|---|---|---|
| Predicted specific sound level (daytime) | $L_{Aeq(15min)}$ = 36dB | 7.3.6 | As the substation and compensator are not yet existing, the noise levels have been predicted using SoundPlan modelling software. Worst case specific sound predicted at NSL2. |
| Residual sound level (daytime) | $L_{Aeq(60min)}$ = 46dB | 7.3.2 | The residual sound level was dominated by road traffic noise on local roads in the area. Background location A3 assessed as this is representative for worst case noise sensitive location (NSL2). |

| Results | | Relevant BS 4142 Clause | Commentary |
|---|---|---|---|
| Background sound level (daytime) | $L_{A90(60min)}$ = 37dB | 8.1.2<br>8.4 | The $L_{A90}$ sound level was measured at the noise sensitive location with the source absent. |
| Assessment made during the daytime, so the reference time interval is 1 hour | | 7.2 | |
| Specific sound level as predicted | $L_{Aeq(15min)}$ = 35dB | 7.3.6 | The specific sound has been predicted by calculation alone as the new battery storage and substation were not existing at the time of the survey. |
| Acoustic feature correction | +0dB | 9.2<br>9.3.2 | It is not anticipated that the specific sound will have any impulsive, tonal or intermittent characteristics. |
| Rating level | (36 + 0) dB = 36dB | 9.2 | |
| Background sound level | $L_{A90(60min)}$ = 37dB | 8 | |
| Excess of rating over background sound level | (36 - 37) dB = -1dB | 11 | Assessment indicates that no adverse impact is likely on the noise sensitive locations as the specific sound is 1dB below the background levels and is lower than the residual sound. Context has also been considered. |
| Uncertainty of the assessment | Not significant | 10 | The specific sound is a worst-case prediction as the assessment assumes the operational plant as listed in Table 13 above. The assessed specific sound is the worst case prediction to NSL2. |

Based on the review of the noise sources and the BS 4142 assessment it is predicted that the noise emanating from the proposed 110kV substation will likely not have an adverse impact.

**NG4**

NG4 recommends a daytime criterion of (07:00hrs – 19:00hrs) 55dB $L_{Aeq,T}$, the predicted noise emissions from the facility are 35 dBA, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved.

*Table 15: Cumulative results at the worst case noise sensitive locations.*

| NSL | Criteria dB $L_{ArT}$ | Daytime Predicted Noise dB $L_{ArT}$ (7:00hrs to 19:00hrs) | Compliant/Non-Compliant |
|---|---|---|---|
| NSL1 | 55 | 35 | Compliant |
| NSL2 | 55 | 36 | Compliant |
| NSL3&4 | 55 | 33 | Compliant |

### 5.4.2 Cumulative Noise Impact (BS 4142 Assessment) for Nighttime Hours

As it has been assumed that the proposed development and the other off site noise sources will operate continuously with the same noise levels in both the day and nighttime, the cumulative noise impact assessment is based on the predicted cumulative noise levels outlined in Table 13.

A BS4142 assessment has been developed at the worst-case location, NSL1. The noise levels at all other noise sensitive locations are predicted to have lower cumulative noise levels than those outlined in Table 16.

*Table 16: Cumulative BS4142 Noise Impact Assessment for nighttime period*

| **Results** | | **Relevant BS 4142 Clause** | **Commentary** |
|---|---|---|---|
| Predicted specific sound level (nighttime) | $L_{Aeq(15min)}$ = 36dB | 7.3.6 | As the substation is not yet existing, the noise levels have been predicted using SoundPlan modelling software. This has been logarithmically added to the predicted noise levels from the other proposed and existing developments. Worst case specific sound predicted at NSL2. |
| Residual sound level (nighttime) | $L_{Aeq(15min)}$ = 37dB | 7.3.2 | The residual sound level was dominated by road traffic noise on local roads in the area, existing substation also audible at A3 during night time period. Background location A4 assessed as this is representative for worst case noise sensitive location (NSL2), average background measurement at A4 assessed. |
| Background sound level (nighttime) | $L_{A90(15min)}$ = 31dB | 8.1.2<br>8.4 | The $L_{A90}$ sound level was measured at the noise sensitive location with the source absent. |
| Assessment made during the daytime, so the reference time interval is 15 minutes | | 7.2 | |
| Specific sound level as predicted | $L_{Aeq(15min)}$ = 36dB | 7.3.6 | The specific sound has been predicted by calculation alone as the new battery storage and substation were not existing at the time of the survey. |
| Acoustic feature correction | +0dB | 9.2<br>9.3.2 | It is not anticipated that the specific sound will have any impulsive, tonal or intermittent characteristics. |
| Rating level | (36 + 0) dB = 36dB | 9.2 | |
| Background sound level | $L_{A90(15min)}$ = 31dB | 8 | |
| Excess of rating over background sound level | (36 - 31) dB = 5dB | 11 | Assessment indicates that there may be a slight adverse impact at NSL2 as the specific sound is 5dB above the background levels. Context has also been considered. The main contributing factor the noise levels at NSL2 is the Battery Energy Storage System and Synchronous Compensator. |
| Uncertainty of the assessment | Not significant | 10 | The specific sound is a worst-case prediction as the assessment assumes the operational plant as listed in Table 13 above. The assessed specific |

| Results | | Relevant BS 4142 Clause | Commentary |
|---|---|---|---|
| | | | sound is the worst case prediction to NSL2. The assessment relies on the accuracy of the assessments conducted by DBA and Fehiley Timoney. |

The cumulative noise impact assessment predicts there may be a slight adverse impact at NSL2. Based on the noise levels from each source the main contributors to the slight excess above background noise are the proposed battery energy storage system and the proposed synchronous compensator. Furthermore, the BESS project is not yet consented therefore this represents a worst case noise impact scenario.

The contributions from each noise source at the noise sensitive locations are outlined in Table 17 below. It can be seen from the table that the not yet consented Battery Energy Storage System is causing the highest contribution to the noise levels at the worst-case sensitive locations. This is reinforced in the DBA report "*Noise Impact Assessment: Proposed Battery Energy Storage System at Knockraha, Co. Cork*" which outlines that the impact from the BESS may cause a slight adverse noise impact at the noise sensitive locations.

*Table 17: NSL noise levels for cumulative noise impact assessment.*

| Location | Predicted Noise Source Contributions, $L_{eq}$ (dBA) | | | | |
|---|---|---|---|---|---|
| | Proposed 110kV Substation | BESS+110 kV (ref 235992) | Existing 220kV Substation | Synchronous Compensator (ref 224488) | Combined |
| NSL2 | 26 | 33 | 26 | 24 | 35 |
| NSL1 | 27 | 32 | 31 | 30 | 35 |
| NSL3&4 | 24 | 31 | 23 | 24[1] | 33 |

(1) Not predicted in Fehiley Timoney report. Prediction of noise impact at these NSLs extrapolated from Fehiley Timoney report.

The predicted noise levels from each source shown in Table 17 without the proposed 110kV substation are predicted to be 35dB at NSL1, therefore the proposed 110kV substation is not predicted to cause an increase in noise levels at the noise sensitive locations.

The proposed Solar Farm (17/5370) which has been assessed by Neo Environmental is approximately 1,700m from the proposed 110kV substation assessed in this report. Based on the distance between the two developments and the already low noise impact outlined in this report, no impact will arise from the solar farm on the noise sensitive locations assessed in this report.

*Table 18: Magnitude of Impacts*

| Noise Change, dB | Magnitude of Impact |
|---|---|
| 0 | No Change |
| 0.1 – 2.9 | Negligible |
| 3 – 4.9 | Minor |
| 5 – 9.9 | Moderate |
| 10+ | Major |

### NG4

NG4 recommends a nighttime criteria of 45dB $L_{Aeq,T}$ , the predicted noise levels from the new substation and battery storage facility are 35 dBA, with no tonality or impulsivity, therefore the NG4 criteria is expected to be achieved.

*Table 19: Model results for the noise impact from the substation for night-time at 4m height.*

| NSL | Criteria dB $L_{Aeq}$ | Nighttime Predicted Noise dB $L_{Aeq}$ (23:00hrs to 07:00hrs) | Compliant/Non-Compliant |
|---|---|---|---|
| NSL1 | 45 | 35 | Compliant |
| NSL2 | 45 | 36 | Compliant |
| NSL3&4 | 45 | 33 | Compliant |

## 5.5 Modelling Assumptions

The following assumptions were made throughout the modelling and assessment:

- Assessment based on the noise measurements undertaken on 20th and 23rd of February 2024.
- Noise source data for the assessment was based on:
    - The measurements undertaken onsite of the 220kV substation
    - Noise sources and information provided by the design team
    - Synchronous Compensator (reference 224488) noise levels as per Fehiley Timoney report "*Knockraha Synchronous Compensator, Further Information Response*".
    - Battery Energy Storage System with onsite 110kV substation (reference 235992) noise levels as per DBA report "*Noise Impact Assessment: Proposed Battery Energy Storage System at Knockraha, Co. Cork*".
- Model assumes a worst-case operating scenario as outlined in Section 5 above and cumulative impact assessment which includes for the BESS which is not yet permitted.
- Modelling based on the drawings, layouts and information provided.
- Assessment based on proposed cumulative noise of the existing and proposed substations, battery storage, and synchronous compensator.

## 5.6 Tonality & Impulsivity

Based on the submitted noise impact assessments for the other developments in the area, no audible tonality is predicted at the noise sensitive locations.

# 6 Conclusion

Wave Dynamics were engaged by Ballyvatta Solar Farm Limited to undertake a noise impact assessment for the new 110kV substation located Knockraha, Ballynanelagh, Co. Cork.

An attended and unattended noise survey was undertaken to measure the existing background noise levels in the area and quantify the existing noise environment.

## Construction Noise and Vibration

The construction noise and vibration from the development has been predicted to the nearest noise sensitive (NSLs) locations of the proposed substation. The construction predictions were based on the procedures outlined in BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise. The construction noise from the development will be of a short-term nature. The works have been assessed on the basis that they will be sequential.

**Based on the assessment outlined in this report it is predicted that the construction noise and vibration from the proposed substation will comply with the recognised best practice standards typically adopted for such projects in Ireland.**

## Operational Noise Impact Assessment

An attended baseline survey was conducted to establish the existing noise environment and project criteria. Based on the nature of the facility there is potential for noise impact during both the day and night-time periods, therefore an assessment for both periods has been conducted.

The noise impact assessment included attended noise measurements at the existing Knockraha 220 kV substation and background noise measurements at the noise sensitive locations. The specific sound of the proposed cumulative noise from all of the proposed developments has been predicted based on a worst-case scenario as outlined in Section 5.

The noise levels from the proposed development in operation were assessed using a BS4142 assessment which predicted that there is an unlikely adverse impact at all noise sensitive locations for both day and nighttime periods. Compliance with EPA NG4 was also assessed and found to be complaint.

The cumulative noise impact for the daytime was assessed and it is predicted that the project criteria will be met for the predicted noise levels from the permitted and existing developments.

Based on the cumulative noise impact there is potential for a slight adverse impact in the nighttime at NSL1 & 2. Based on the noise source contributions the dominating noise sources are the battery energy storage system, followed by the proposed Synchronous Compensator. This is reinforced in the DBA report "*Noise Impact Assessment: Proposed Battery Energy Storage System at Knockraha, Co. Cork*" which outlines that the impact from the BESS may cause a slight adverse noise impact on its own at the noise sensitive locations. The proposed 110kV substation is not expected to cause an increase in noise levels at the NSLs.

**Based on the assessment outlined in this report it is predicted that noise levels from the proposed 110kV substation will comply with the project criteria at all noise sensitive locations.**

# Appendix A- Glossary of Terms

| | |
|---|---|
| Ambient Noise | The totally encompassing sound in a given situation at a given time, usually composed of sound from all the noise sources in the area. |
| Background Noise | The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$). |
| dB | Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa). |
| dB(A) | An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies. |
| Hertz | The unit of sound frequency in cycles per second. |
| $L_{A90}$ | A-weighted, sound level just exceeded for 90% of the measurement period and calculated by statistical analysis. See also the background noise level. |
| $L_{Aeq}$ | A-weighted, equivalent continuous sound level. |
| $L_{AFmax}$ | A-weighted, maximum, sound level measured with a fast time-constant - maximum is not peak |